XXXIX.—*A List of Californian Diatoms.*

By C. Mereschkowsky.

[Plates IV. & V.]

The recent marine Diatoms of California are interesting in more than one respect. In the first place a list of Californian Diatoms will form a desirable contribution to our knowledge of the geographical distribution of these little Algæ, the more so as the Diatom flora of the Pacific is as yet but very little known. Then, again, the study of recent Californian Diatoms as compared with the extensive fossil deposits of this region is of interest in order to ascertain which of the fossil forms have disappeared and which are still living, and whether these latter have changed in the course of time or not.

It is for these reasons that I undertook the study of Californian Diatoms, which I intend to carry out as completely as possible—a task which will certainly require a number of years in order to accomplish it with a certain degree of completeness. At the present time I will only give a short preliminary list, partly composed of forms observed by myself so far as I have been able to determine them, partly of some species which have been previously noticed by other diatomists, especially by Cleve in his 'Synopsis of the Naviculoid Diatoms,' as well as by a few others (Grunow, Greville). This list will also contain the species which I have already mentioned and partly described in a previous publication entitled 'On Polynesian Diatoms,' the fourth chapter of which deals with Diatoms belonging to the Californian coast.

The reader will find in this paper the description of a number of new species and varieties, accompanied by figures. Some of them are small and delicate forms which I have observed in a living state or in preserved crude material, and which can hardly be expected to be found in slides, as such forms usually completely disappear during the cleaning of the material. Certain details of their structure (such as the striæ when very fine) could not, for this reason, be ascertained.

In the list I indicate the person who has observed the species by the first letter of his name—C. meaning Cleve, G. Grunow, Gv. Greville, and M. myself.

1. **Diploneis bombus**, var. **bullata**, Cl. [C.]
2. **Diploneis bombus**, var. **densestriata**, Cl. [C.]
3. **Diploneis contigua**, var. **eudoxia**, A. S. [C.]

4. **Diploneis gemmata**, var. **typica**, Cl. Calif. guano. [C.]
5. **Diploneis papula**, A. S. Santa Monica, amongst *Macrocystis*, not rare; Monterey, rare. [M.]

The endochrome of this species (Pl. IV. fig. 26) is very interesting; it is composed of two plates, which, however, are not disposed only along both sides of the valve, leaving its apices free, as is usually the case in the Naviculoid Diatoms, but partly enter into the other half of the valve, thus occupying both ends of the frustule.

6. **Diploneis splendida**, var. **puella**, A. S. [C.]
7. **Diploneis subcincta**, A. S. [C.]
8. **Diploneis vacillans**, A. S. [C.]
9. **Diploneis vacillans**, var. **delicatula**, Cl. Santa Monica, recent. [M.]

Length 0·043 mm., breadth of the valve 0·017 mm.

10. **Caloneis formosa**, Greg. San Pedro, not rare. [C., M.]
11. **Caloneis formosa**, var. **quadrilineata**, Grun. [C.]
12. **Caloneis liber**, var. **elongata**, Grun. Rare. [M.]
13. **Caloneis Schumanniana**, var. **trinodis**, Lewis. [C.]
14. **Navicula approximata**, Grev. Calif. guano. [C.]
15. **Navicula (Schyzonema) avenacea**, Bréb. San Pedro, common. [M.]
16. **Navicula cancellata**, Donk. San Pedro, not very common. [M.]

Striæ 5 in 0·01 mm. Chromatophores with margins profoundly sinuated.

17. **Navicula clavata**, var. **caribæa**, Cl. (forma minor). Northern California, not very rare. [M.]
18. **Navicula directa**, var. **heterostriata**, Mer. (Mereschkowsky, On Polyn. Diat. part iv.). Northern California, rather common. [M.]
19. **Navicula Febigerii**, Cl. [C.]
20. **Navicula forcipata**, Grev. San Pedro, rare. [C., M.]
21. **Navicula forcipata**, var. **densestriata**, A. S. San Pedro, not rare. [M.]

The form which I have observed has the fine striation characteristic of this variety, but the lateral areas are not or scantily constricted in the middle. I have succeeded in examining a frustule in a vertical position and obtaining in this way an optical section through it, which is represented

in the fig. 24 of Plate IV. The raphe is to be seen as a crack in the wall of the frustule, and the areas are deep invaginations of the surface of the valve on both sides of the raphe.

22. **Navicula forcipata, var. nummularia**, Grev. Calif. guano. [C.]

23. **Navicula (Rhoiconeis) garkeana**, Gr. California, North Pacific. [C.]

24. **Navicula (Rhoiconeis) genuflexa**, Kütz. San Pedro, rather common. [M.]

The endochrome is composed of two chromatophore-plates, with a deep and narrow sinus on each side in the middle of the plates, and usually two, sometimes more, elæoplasts (Pl. IV. fig. 25).

25. **Navicula granulata**, Bail. (*Navicula Baileyana*, Gr.). Calif. guano; North California, rare. [C., M.]

26. **Navicula (Libellus) Grevillei**, Ag. [C.]

27. **Navicula (Libellus) hamulifera**, Grun.? San Pedro. [M.]

28. **Navicula Hennedyi**, W. Sm. [C.]

29. **Navicula Hennedyi, var. californica**, Grev. [C.]

30. **Navicula Hennedyi, var. circumsecta**, Grun. [C.]

It is on account of its synonym *Nav. californica*, A. S., that I have placed this species in the list of Californian Diatoms, although Cleve does not mention it in his 'Synopsis' as belonging to this locality.

31. **Navicula irrorata**, Grev. Calif. guano. [C.]

32. **Navicula libellus**, Greg. Santa Monica, amongst *Macrocystis*, not very common. [M.]

Length 0·084 mm. Endochrome composed of two chromatophore-plates of the same shape and disposition as in *N. complanata* *, but the inner angles of the plates are united by a loop or narrow band crossing the interior of the cell, so that in reality there is but one plate. I am very much inclined to think that such a connecting band exists also in *N. complanata*.

33. **Navicula lyra, var. dilatata**, A. S. San Pedro. Rare. [M.]

34. **Navicula lyra, var. recta**, Grev. Calif. guano. [C.]

35. **Navicula (Schyzonema) mollis**, W. Sm. San Pedro, rather common. [M.]

* Cleve, 'Synopsis of the Naviculoid Diatoms,' part i. p. 153.

36. **Navicula mutica**, forma **Cohnii**, Hilse. Lost Spring Ranche, foss.? [C.]

37. **Navicula ostrearia**, Turp. (*N. fusiformis*, var. *ostrearia*). San Pedro, not very common. [M.]

I have not seen the characteristic blue colour at the apices of the frustule; but this is not a constant character, and in the Black Sea, where this species is very common, I often met with specimens showing no trace of blue colour.

38. **Navicula pennata**, A. S. Northern California, not rare. [M.]

I have already mentioned the occurrence of this species in the Glacial Ocean (Wankarema, North Siberia) *.

39. **Navicula prætexta**, Ehr. [C., M.]

I have seen only a fragment of a valve in a slide containing diatoms from San Pedro Bay.

40. **Navicula punctulata**, W. Sm. Rather common in a laguna near San Pedro. [C., M.]

41. **Navicula (Libellus) reticulata**, Mer. San Pedro, Santa Catalina Island, very common. [M.]

A detailed description of this species will be found in my paper on the Diatoms of the Black Sea, where it is also very common, as well as in the Mediterranean (Villefranche). Its endochrome is very curious, the single plate forming a complicated network covering the surface of both connecting membranes with transverse bands crossing the interior of the cellule.

42. **Pinnularia cruciformis**, Donk. Northern California, rare. [M.]

43. **Brebissonia Boeckii** (Kütz.), Grun. San Pedro, rare. [M.]

Length 0·097 mm., breadth of the valve 0·021 mm., striæ 8 in 0·01 mm. in the middle (not 10, as stated by Cleve).

44. **Frustulia interposita**, Lewis. Oakland, Calif., brackish. [C.]

45. **Anomœoneis sculpta**, var. **major**, Cl. Santa Rosa, brackish. [C.]

46. **Scoliotropis latestriata**, Cl. [C.]

47. **Gomphonema kamtschaticum**, var. **californica**, Grun. Monterey, not very rare; San Francisco. [C., M.]

According to Cleve, length 0·03 mm., striæ 15 in 0·01 mm., valve linear.

* See my paper "On Polynesian Diatoms," chapter iv.

48. **Trachyneis aspera**, Ehr. San Pedro, common; Monterey, rather common. [M.]

49. **Trachyneis aspera**, var. **intermedia**, Grun. San Pedro, not rare. [M.]

Valve lanceolate, axial area rather broad on one side of the raphe, absent on the other.

50. **Pleurosigma æstuarii**, Bréb. San Pedro, rare. [C., M.]

51. **Pleurosigma cuspidatum**, Cl. San Pedro, not rare. [M.]

Endochrome composed of four narrow bands, having the same disposition as in *P. Normanii*.

52. **Pleurosigma elongatum**, W. Sm. Laguna near San Pedro, marine and brackish, common. [M.]

Endochrome composed of four elongate and straight bands.

53. **Pleurosigma formosum**, W. Sm. Northern California, rather common. [M.]

Endochrome composed of four very elongate and tortuous bands.

54. **Pleurosigma formosum**, var. **longissima**, Grun. San Pedro, not rare. [M.]

Length of the valve	0·463	0·538
Breadth	0·042	0·055
Oblique striæ	10–11	11–12·5

Valves broader than in the type species; differs from var. *balearica*, which has the same broad valves, by the striæ, which in the latter are 8–9 in 0·01 mm.

55. **Pleurosigma latum**, Cl. Santa Monica, on *Macrocystis*, rather common. [M.]

Endochrome composed of four bands forming several undulations of exactly the same kind as in *P. Normanii* and *P. cuspidatum*.

56. **Pleurosigma nubecula**, W. Sm. Santa Monica, amongst *Macrocystis*; Monterey, common. [C., M.]

Endochrome composed of four elongate and very tortuous bands.

57. **Pleurosigma rhombeum**, Grun. [C.]

58. **Gyrosigma attenuatum**, Kütz. San Pedro, rare. [M.]

59. **Gyrosigma balticum**, var. **californica**, Grun. Laguna near San Pedro, not rare. [C., M.]

Endochrome composed of two perforated chromatophore-plates; perforations narrow, oblique.

60. **Gyrosigma fasciola** (Ehr.), Cl. San Pedro, common. [M.]

61. **Gyrosigma Febigerii** (Grun.), Cl. Laguna near San Pedro in nearly marine water, rather common. [C., M.]

62. **Gyrosigma prolongatum**, W. Sm. San Pedro, very common. [M.]

I do not see any difference between *G. prolongatum* and var. *closteroides*, Grun., the prolongations of the valve being turned on opposite sides or on the same side, according to the position of the frustule.

63. **Gyrosigma Spencerii**, var. **exilis**, Grun. Laguna near San Pedro, very common. [M.]

64. **Gyrosigma tenuissimum**, W. Sm. [C.]

65. **Gyrosigma Wansbeckii** (Donk.), Cl. Laguna near San Pedro, rare. [M.]

Looks like *G. balticum*, but the striæ are much finer.

In all the species of *Gyrosigma* above mentioned which I have observed myself, as well as in many others from the Mediterranean and the Black Sea, I have invariably found the endochrome to be composed of two plates, while in all species of *Pleurosigma* (with the only exception of *P. rigidum*, where it is granular) the endochrome consists of four narrow, usually tortuous bands. This proves that *Gyrosigma* and *Pleurosigma* must be regarded as two natural and distinct groups, which should not be united in one genus, as has been done by certain diatomists.

66. **Mastogloia (Orthoneis) Wrightii**, O'Meara* (nec Cleve). (Pl. IV. figs. 22, 23.) Northern California, not rare. [M.]

Valve elliptic, with apices broadly rounded.

Length:	0·015	0·018	0·020	0·020	0·021	0·028
Breadth:	0·011	0·0125	0·014	0·014	0·014	0·020

Median line straight, enclosed between two parallel rows of puncta not differing from the rest; axial area linear, distinct. Puncta of the valve forming transverse and decussating rows, the former radiate, about 8–9 in 0·01 mm.†; two of the median decussating rows more distant, forming a double lyre-like figure with both halves uniting at the centre with the axial area; marginal rim narrow, with quadrangular loculi, 8–9 in 0·01 mm.

* 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. lxxvii. fig. 6.

† The engraver did not succeed in representing the great regularity in the disposition of the puncta, the transverse rows which the latter form being therefore invisible in figures 22 and 23 of the Plate.

The double lyre-like figure has been reproduced by O'Meara in an exaggerated way; it is not nearly so distinct as in his figure, and is not limited by lines, but by two decussating rows a little more distant than the others.

As to the diatom which has been described by Cleve * under this name, it belongs in all probability to another species, as he does not mention the lyre-like figure; but, on the other hand, he mentions the existence of a double row of puncta between which the median line is enclosed, which means, I suppose, that these puncta are distinct from the rest, as they are, for instance, in *M.* (*O.*) *barbadensis*, Grev.†, and which is not the case in *M.* (*O.*) *Wrightii*, these puncta not differing from the others. This would explain the remark which Cleve makes at the end of his description, when he says, "None of the figures (that of O'Meara inclusive) corresponds exactly with this species, so that the identification is doubtful." It is evident that this author has had in view some other species than the original *M.* (*O.*) *Wrightii* of O'Meara, or some variety of the latter.

67. **Mastogloia pumila**, Grun. San Pedro, not very rare. [M.]

68. **Amphora acuta**, var. **arcuata**, A. S. San Pedro, rare. [M.]

Length 0·086, breadth of the frustule 0·068 mm.; zone with 4 longitudinal divisions in 0·01 mm.

69. **Amphora acutiuscula**, Kütz. Laguna near San Pedro, common. [M.]

70. **Amphora angusta** (Greg.), Cl. San Pedro, rather rare. [M.]

71. **Amphora angusta**, var. **ventricosa**, Greg. [C.]

72. **Amphora coffæiformis**, Ag. San Pedro, common. [M.]

73. **Amphora costata**, W. Sm. San Pedro, not common. [M.]

74. **Amphora hyalina**, Kütz. San Pedro, rare. [M.]

75. **Amphora lineolata**, Ehr. San Pedro, common. [C., M.]

76. **Amphora marina**, W. Sm. Monterey, rare. [M.

77. **Amphora ostrearia**, Bréb. San Pedro, common. [M.]

78. **Amphora proteus**, Greg. Northern California, rare. [M.]

79. **Amphiprora alata**, Kütz. Santa Monica, brackish, very common. [C., M.]

Endrochrome composed of two plates disposed transversely, leaving in the centre a circular hyaline space.

80. **Amphiprora paludosa**, W. Sm. San Pedro. [M.]

* Cleve, 'Synopsis of the Naviculoid Diatoms,' part ii. p. 148.

† 'Diatomeentafeln zusamm. f. ein. Fr.' pl. lv. fig. 10.

81. **Amphiprora paludosa**, var. **hyalina**, Eul. San Pedro, not rare. [M.]

Endochrome composed of one plate with margins indented. Length 0·033 mm.

82. **Tropidoneis elegans** (W. Sm.), Cl. San Pedro, not very common. [M.]

Endochrome composed of two plates.

83. **Tropidoneis vitrea** (W. Sm.), Cl. [C.]

84. **Campyloneis Grevillei** (W. Sm.), Grun., var. **typica**. San Pedro, rare; Monterey, rare. [M.]

85. **Campyloneis Grevillei**, var. **regalis**, Grev. Calif. guano; San Pedro, rare. [C., M.]

86. **Cocconeis costata**, Greg. Northern California, common. [M.]

87. **Cocconeis costata**, var. **hexagona**, Grun. San Pedro; Monterey, rare, marine. [M.]

Length 0·016–0·0205 mm., breadth 0·008–0·0115 mm.; axial area narrow, lanceolate.

88. **Cocconeis costata**, var. **pacifica**, Grun. Southern California (*Haliotus* washings), very common; Monterey, very common. [M.]

89. **Cocconeis dirupta**, var. **typica**, Cl. [C.]

90. **Cocconeis heteroidea**, var. **sigmoidea**, Grun. Santa Monica, on *Macrocystis*, not very rare. [M.]

91. **Cocconeis pellucida**, Hantzsch. Northern California, rare. [M.]

92. **Cocconeis placentula**, Ehr. [C., M.]

93. **Cocconeis placentula**, var. **lineata**, Ehr. [M.]

94. **Cocconeis pseudomarginata**, Greg. San Pedro; Monterey, not common. [M.]

95. **Cocconeis scutellum**, Ehr. Rare. [C., M.]

96. **Cocconeis scutellum**, var. **adjuncta**, A. S.* Northern California, rather rare. [M.]

97. **Cocconeis scutellum**, var. **californica**, Grun. [C.]

98. **Cocconeis scutellum**, var. **ornata**, Grun. Northern California; Monterey, rare. [M.]

Length:	0·042	0·047	0·053
Breadth:	0·028	0·031	0·035

Four rows of puncta in 0·01 mm.; puncta very large, quadrangular.

* H. Peragallo, 'Diatomées marines de France,' plate iv. fig. 2.

99. **Achnanthidium delicatula**, Kütz. [C.]

100. **Achnanthidium glabrata**, Grun. San Pedro, not rare. [C., M.]

According to Grunow (Arct. Diat. p. 22) very common in the Pacific, especially on the coast of North and South America. Striæ 12–13 in 0·01 mm. Valve narrow, linear; looks like a small *A. brevipes*, var. *angustata*, of which it might be a variety. Length 0·046 mm.

101. **Achnanthes longipes**, C. Ag. San Pedro, rather rare. [M.]

102. **Rhoicosphenia curvata**, Kütz. San Pedro, rare. [M.]

103. **Epithemia gibba**, Kütz. Northern California, not very rare. [M.]

[To be continued.]

MISCELLANEOUS.

The Locality of the Type of Prionastræa Vaughani, *Gregory.*

To the Editors of the 'Annals and Magazine of Natural History.'

Gentlemen,—In the 'Annals and Magazine of Natural History' for December 1899, pp. 458, 459, figs. 2 *a* & 2 *b*, Prof. J. W. Gregory has described and named an Eocene coral from Alabama as *Prionastræa Vaughani*, doing me the honour to use my name in the specific designation. Prof. Gregory makes the following remark under the side-heading "*Affinities*":—"Mr. Vaughan informs me that the precise locality is, no doubt, Huntsville, Ala." I pointed out to Prof. Gregory, when I was in the British Museum (Natural History), that this coral was undescribed and unnamed, and requested him to please name and describe it, but he is mistaken in saying that I told him it came from Huntsville, Alabama. Huntsville, Alabama, is in the extreme northern portion of the State, in Madison County, and is only 18 miles south of the Tennessee line. Geologically, it is situated on rocks near the base of the Subcarboniferous, the Tuscumbia limestone (see Eugene A. Smith's Geological Map of Alabama, Ala. Geol. Surv. 1894). I am not sure whence the type of *Prionastræa Vaughani* comes, but I am under the impression that it is from Gregg's Landing, on the Alabama River, in Monroe County. Mr. T. H. Aldrich, of Birmingham, Ala., sent the specimen to the British Museum (Natural History), but, unfortunately, seems to have no other.

Very respectfully yours,

T. Wayland Vaughan.

U.S. Geological Survey.
Jan. 21, 1901.